**In the United States Patent and Trademark Office**

**Before the Board of Appeals and Interference.**

Appeal Brief

Applicant: Timm et al

USSN: 10/715889

Filed: 11/17/2003

Title: A dryer bar apparatus of a dryer.

Examiner Kenneth Rinehart.

Art unit: 3749

Docket: 1349

Mail Stop Appeal Brief

Commissioner for Patents,

P.O. Box 1450

Alexandria. VA 22313-1450

**C Paris Patent Appeals Specialist**

Sir,

**Response to Notification.**

In response to the Notification mailed 09/03/2008, Appellant files herewith a modified Appeal Brief which is in conformity with the requirements set forth in the Notification.

Appellant also files herewith a petition for a one month extension.

Respectfully submitted,

David J Archer.

Reg No. 31, 076

Applicants representative.

**(A) Identification page**

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Sir,

**<u>Appeal Brief.</u>**

The following is an appeal brief filed pursuant to a Notice of Appeal filed June 12, 2008. Claims 1-14 were finally rejected in an Office Action mailed March 12, 2008. In the aforementioned final Office Action, claims 15 and 16 were allowed.

## Table of Contents.

**(C)**

**(i)** **The Real party in interest is:**

**Kadant Johnson Inc.**

**(D)**

**(ii)** **<u>Related appeals and interferences.</u>**

**There are no related appeals or interferences.**

**(E)**

**(iii) <u>Status of claims</u>:**

**Claim 1 rejected**

**Claim 2 rejected**

**Claim 3 rejected**

**Claim 4 rejected**

**Claim 5 rejected**

**Claim 6 rejected**

**Claim 7 rejected**

**Claim 8 rejected**

**Claim 9 rejected**

**Claim 10 rejected**

**Claim 11 rejected**

**Claim 12 rejected**

**Claim 13 rejected**

**Claim 14 rejected**

**Claims 15 allowed.**

**Claims 16 allowed**

**Claims 17 cancelled**

**Claims 18 cancelled**

**Claims 19 cancelled**

**Claims 20 cancelled**

**Claims 21 cancelled**

**Claims 22 cancelled**

**Claims 23 cancelled**

**Claims 24 cancelled**

**(F)**

**(iv) Status of Amendments:**

**No amendment to the claims has been filed since the final rejection.**

**(G)**

**(v)** **Summary of claimed subject matter:**

**Independent claim 1** **Paragraph 0098 of the published specification describes**

a dryer bar apparatus 36 of a dryer 38 for drying a web $W^b$ in a papermaking machine, the apparatus 36 comprising:

a rotatable dryer shell 12 of cylindrical configuration, the dryer shell having an outer surface 34 for drying the web $W^b$;

the dryer shell 12 having an inner surface 16 which defines an enclosure 14, the inner surface 16 having a radius Ri;

the enclosure 14 being connected to a source of pressurized steam 40 such that in operation of the dryer 38, a transfer of thermal energy from the steam within the enclosure 14 through the inner surface 16 of the dryer shell 12 to the outer surface 34 of the dryer shell 12 is achieved so that the web $W^b$ is dried;

a syphon 30 disposed within the enclosure 14 for controlling a layer 32 of condensed steam 10 accumulating adjacent to the inner surface 16 of the dryer shell 12 during operation of the apparatus 36;

a specific number N of turbulence bars such as 18 to 23 are disposed within the enclosure 14 for

maximizing uniformity of the transfer of thermal energy in a cross machine direction CD and minimizing the transfer of thermal energy through the dryer shell 12 from the inner surface 16 to the outer surface 34, each of the turbulence bars such as 18 to 23 extending in a cross machine direction CD in contact with the inner surface 16, the bars such as 18 to 23 being circumferentially spaced equidistantly around the inner surface 16 of the dryer shell 12 for generating turbulence within the layer 32 so that uniformity of the transfer of thermal energy in the cross machine direction CD is maximized while the transfer of thermal energy through the dryer shell 12 from the inner surface 16 to the outer surface 34 is minimized; and

the maximizing uniformity of the transfer of thermal energy in the cross machine direction CD and minimizing the transfer of thermal energy through the dryer shell 12 from the inner surface 16 to the outer surface 34 being attained by the fitting of the specific number N of turbulence bars such as 18-23 within the dryer shell 12;

the specific number N of turbulence bars such as 18-23 being determined by the equation:

$$N = \mathrm{int}\ \{\ [2\ \pi\ Ri\ /\ [4\ \pi\ (Ri\ \delta)^{1/2} + W]\ \}$$

**Paragraph 0099 of the published specification describes**

N= the specific number of turbulence bars in the dryer shell 12;

**Paragraph 0100 of the published specification describes** int= an integer number of a value in {} brackets;

**Paragraph 0101 of the published specification describes** $\pi = 3.1415$;

**Paragraph 0102 of the published specification describes** Ri = the inside radius of the inner surface 16 of the dryer shell 16 in inches;

**Paragraph 0103 of the published specification describes** $\delta$ = an average depth of the layer 32 in inches;

**Paragraph 0104 of the published specification describes** W= a width of each of the turbulence bars in inches.

**Independent claim 12.** **Paragraph 0111 of the published specification describes**

A dryer bar apparatus 36 of a dryer 38 for drying a web $W^b$ in a papermaking machine, the apparatus 36 comprising:

a rotatable dryer shell 12 of cylindrical configuration, the shell 12 defining an outer surface 34 and an inner surface 16;

a number N of dryer bars such as 18 to 23 pressed outwardly against the inner surface 16, each of the bars such as 18 to 23 extending in a cross machine direction CD along the inner surface 16; and

each bar such as 18 being spaced from an adjacent bar 19 by a quarter-resonant spacing S for maximizing uniformity of the transfer of thermal energy in the cross machine direction CD and minimizing the transfer of thermal energy through the dryer shell 12 from the inner 16 to the

outer surface 34, such that a rate of heat transfer through the dryer shell 12 from the inner surface 16 to the outer surface 34 is minimized while optimizing a temperature uniformity in the cross machine direction CD.

**(H)**

**(vi)** **<u>Grounds of rejection to be reviewed on appeal.</u>**

1/ Claims 1-3, 5-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Salminen US5,564,494.

2/ Claims 1-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Barnscheidt US 3217426.

3/ Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Barnscheidt et al US 3217426 as applied to claim 12 above and further in view of Wimmer 4478168.

4/ Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Barnscheidt et al US 3217426 as applied to claim 12 above, and further in view of Ives 7028756.

(I)

(vii) **Arguments.**

1/ An essential and very important feature of the present invention is the provision of a dryer shell **(12)** with internal bars positioned and spaced according to the present invention, in which the transfer of heat from the inside surface **(16)** to the outside surface **(34)** of the rotating dryer shell **(12)** maximizes **uniformity** of the transfer of thermal energy in the cross machine direction **(CD)** and **minimizes** the transfer of thermal energy through the dryer shell **(12)** from the inner surface **(16)** to the outer surface **(34).**

In claim 1, the specific number of bars is recited in order to **minimize** flow of heat from the steam through the dryer shell **(12)** so that the **uniformity,** in a cross machine direction CD, of the flow of heat through the dryer shell (12) is increased or maximized.

An objective of the present invention, as claimed in claim 1, is to have the same amount of heat flow through the dryer shell **(12)** all the way along the dryer shell **(12)** in a cross machine direction **CD** so that the web $\mathbf{W^b}$ will be equally dried in a cross machine direction **CD**. Claim 1 is **not** claiming **maximizing** the heat flow from the inner surface **(16)** to the outer surface **(34)** but rather **minimizing** the heat flow through the rimming condensate layer **(32)** while maximizing the **uniformity** of such heat flow in a cross machine direction **CD**.

The applied Salminen reference seeks to achieve heat transfer uniformity, but it has as a primary

objective **maximizing** the transfer of heat. This reference does not give even a hint concerning the aforementioned objective of **minimizing** the transfer of heat or the surprising discovery recited in claim 1 of the present application for producing uniformity of heat transfer while minimizing the transfer of heat. Furthermore, the applied Salminen reference does not teach the recited formula for achieving the required spacing for achieving such advantageous CD heat transfer uniformity while achieving low heat transfer. Still further, Salminen does not even teach the provision of cross-machine bars for inducing a low, but uniform, level of turbulence in the condensate layer between the bars.

The Examiner has taken the position that "applicant is merely optimizing the transfer of energy (the transfer of thermal energy in said cross machine direction or through said dryer shell being maximized or minimized, etc, uniform heat transfer with low heat transfer rate) which is well within the ability of an individual of ordinary skill. This is merely the result of the claimed spacing. The applicant is merely providing a certain number or spacing of bars to provide for an optimized result."

Appellants respectfully disagree with the Examiner's position for the following reason:

Claim 1 defines a configuration that will **minimize** the heat transfer through the dryer shell (12) from the inner surface **(16)** to the outer surface **(34)** and simultaneously achieve a flow of heat which is uniform along the CD direction, by using a unique configuration of dryer bars, while one skilled in the art would only consider dryer bars to **maximize** the heat transfer through the dryer. Such claimed arrangement is, if anything, contrary to what an individual of ordinary skill

would think of doing.

More specifically, the Salminen reference makes reference in the abstract to "improved heat transfer", specifically increased heat transfer. The object of the subject invention, however, is **reduced** heat transfer, directing one skilled in the art away from the Salminen concepts.

Even more specifically, at column 8, line 38, Salminen highlights a configuration in that "further enhances the rate of heat transfer". This addresses the problem of low heat transfer that occurs when the condensate is rimming and minimizes the bowing of the roll when the roll is stopped for feeding a different size or type of paper sheet through the corrugating roll. When the roll stops rotating, the steam which condenses puddles, pools or collects at the bottom of the inside surface of the roll . This layer of condensate at the bottom of the roll insulates the bottom of the roll from a flow of heat from the steam inside the roll. When the paper sheet is threaded and the roll begins rotating again after for example a 5 minute stoppage, the flow of heat through the roll will be non uniform for a considerable time after the start up even though the rimming speed has already been attained in which the condensate is evenly thrown by centrifugal force against the inner surface of the roll.

In Salminen, the aforementioned problem is addressed. However, such problem is not the problem that is addressed and solved by the arrangement recited in appealed claim 12. In the present invention, the dryer is always rotating and the condensate is always rimming inside the dryer cylinder and thermal bowing of the cylinder is not a problem to be solved.

Further, Salminen is specifically addressing the objective of **increasing** the transfer of heat from the roll by **minimizing** the thickness of the condensate layer. For example, in Col. 3 Lines 12-19, "Under rimming conditions, heat transfer is governed both by the thickness of the condensate and by fluid flow characteristics. The thinner the layer and more turbulent the flow, the less the resistance to heat transfer. Thickness of the condensate depends on the design, size, location and clearance of the siphon which extracts the condensate from the interior of the roll, roll speed and diameter, condensing rate and differential pressure. Turbulence depends on the condensate thickness and roll speed and diameter. **Minimizing** the condensate thickness, although resulting in a minimum of turbulence, will result in a **lower** resistance to, and greater uniformity of, heat transfer." In the present invention, the condensate thickness is not **minimized** to produce **lower** resistance, but rather is **optimized** to produce **higher** resistance to heat transfer."

Accordingly, Salminen addresses and endeavors to provide a solution to the problem of low heat transfer, but does not teach or disclose the combination claimed in claim 1 to solve the problem of non uniformity of heat transfer in the cross machine direction while **reducing** the transfer of heat.

Moreover, claim 1 provides an arrangement which greatly **reduces** the transfer of heat compared to other arrangements of dryer bars, while at the same time producing uniformity of heat transfer in a cross machine direction thus enabling the continuous production of a paper web which is dried more evenly along the width thereof in a **CD**. Such uniform **CD** drying in turn enhances any subsequent sizing, calendering or printing of the resultant web.

In the applied Salminen reference, there are no cross-machine dryer bars for generating uniformity of turbulence in the layer of condensate that would otherwise build up within the shell **(108)** thus insulating the shell **(108)** from the heat of the steam within the shell **(108)**. Instead, Salminen teaches an insert which defines a plurality of CD valleys **(130)** which increase in cross sectional area in a direction from the respective sides **(106)** of the dryer shell **(108)** towards the siphon tube **126** located midway between the sides **(106)** of the dryer shell **(108).** Thus, the thickness of the insulating condensate is greatly reduced and the heat flow through the shell **(108)** will be correspondingly increased. Such **CD** valleys **maximize** the flow of heat from the steam through the shell **(108)** in a vicinity of the sides **(106)** of the shell **(108).**

However, in the present invention, rather than **maximize** the flow of heat with an insert that **reduces** the thickness of the condensate layer and **reduces** the condensate turbulence, the present invention **minimizes** the flow of heat by using an unique configuration of dryer bars that produce **uniform** turbulence with an **optimized** condensate layer thickness. More specifically, the present invention has a totally opposite objective and has uses a totally opposite approach with its solution. The specific spacing of the bars is provided by the formula recited in claim 1 in order to **minimize** flow of heat from the steam through the shell so that the **uniformity,** in a cross machine direction **CD**, of the flow of heat through the shell **(12)** is increased or **maximized**.

**2/ Claim 12 recites:**

"each bar being spaced from an adjacent bar by a quarter-resonant spacing for maximizing uniformity of the transfer of thermal energy in the cross machine direction and minimizing the

transfer of thermal energy through the dryer shell from the inner to the outer surface, such that a rate of heat transfer through the dryer shell from the inner to the outer surface is minimized while optimizing a temperature uniformity in the cross machine direction."

An essential and very important feature of the present invention as recited in independent claim 12 is the provision of a dryer shell **(12)** in which the transfer of heat from the inside surface **(16)** to the outside surface **(34)** of the shell **(12)** maximizes uniformity of the transfer of thermal energy in the cross machine direction **(CD)** and **minimizes** the transfer of thermal energy through the dryer shell **(12)** from the inner surface **(16)** to the outer surface **(34).**

In the applied Salminen reference, there are no dryer bars for generating uniformity of turbulence in the layer of condensate that would otherwise build up within the dryer shell thus insulating the heat of the steam from the inner surface of the shell. Instead, Salminen teaches an insert which defines a plurality of CD valleys **(130)** which increase in cross sectional area in a direction from the respective sides **(106)** of the dryer shell **(108)** towards the siphon **(126)** located midway between the sides **(106)** of the dryer shell **(108)**. Thus, in Salminen, the thickness of the insulating condensate is greatly reduced and the heat transfer rate correspondingly increased. . Such CD valleys **maximizes** the flow of heat of the steam through the shell **(108)** in a vicinity of the sides **(106)** of the shell **(108)**.

However, in the present invention, rather than **maximize** the flow of heat, the opposite condition is being sought in order to **minimize** the flow of heat while at the same time maximizing the **uniformity** in a cross machine direction CD of such heat flow. The specific spacing of the bars

by a quarter resonance is provided in order to **minimize** flow of heat from the steam through the dryer shell **(12)** so that the **uniformity,** in a cross machine direction **CD**, of the flow of heat through the dryer shell **(12)** is increased or maximized.

An objective of the present invention, as claimed in claim **(12)**, is to have the same amount of heat flow through the dryer shell **(12)** all the way along the dryer shell **(12)** in a cross machine direction **CD** so that the web **$W^b$** will be equally dried all of the way along a cross machine direction **CD** of the web.

More particularly, claim 12 is **not** claiming maximizing the heat flow from the inner surface **(16)** to the outer surface **(34)** but rather **maximizing the uniformity** of such heat flow in a cross machine direction **CD**. This is achieved by decreasing or **reducing** such heat flow of the steam through the condensate layer **(32)** to a **minimum**.

The applied Salminen reference does not give even a hint concerning the aforementioned surprising discovery recited in claim 12 of the present application. Furthermore, the applied Salminen reference does not teach the quarter resonant spacing recited in claim 12 for achieving the advantageous result of the present invention. Also, Salminen does not teach any dryer bars.

Respectfully submitted,

David J. Archer

Applicant's representative

Reg. No. 31,076

(J)

(viii) Claims appendix.

1. A dryer bar apparatus of a dryer for drying a web in a papermaking machine, the apparatus comprising:

a rotatable dryer shell of cylindrical configuration, the dryer shell having an outer surface for drying the web;

the dryer shell having an inner surface which defines an enclosure, the inner surface having a radius Ri;

the enclosure being connected to a source of pressurized steam such that in operation of the dryer, a transfer of thermal energy from the steam within the enclosure through the inner surface of the dryer shell to the outer surface of the dryer shell is achieved so that the web is dried;

a syphon disposed within the enclosure for controlling a layer of condensed steam accumulating adjacent to the inner surface of the dryer shell during operation of the apparatus;

a specific number of turbulence bars disposed within the enclosure for maximizing uniformity of the transfer of thermal energy in a cross machine direction and minimizing the transfer of

thermal energy through the dryer shell from the inner to the outer surface, each of the turbulence bars extending in a cross machine direction in contact with the inner surface, the bars being circumferentially spaced equidistantly around the inner surface of the dryer shell for generating turbulence within the layer so that uniformity of the transfer of thermal energy in the cross machine direction is maximized while the transfer of thermal energy through the dryer shell from the inner to the outer surface is minimized; and

the maximizing uniformity of the transfer of thermal energy in the cross machine direction and minimizing the transfer of thermal energy through the dryer shell from the inner to the outer surface being attained by the fitting of the specific number of turbulence bars within the dryer shell;

the specific number of turbulence bars being determined by the equation:

$$N = \text{int}\ \{\ [2\ \pi\ Ri\ /\ [4\ \pi\ (Ri\ \delta)^{1/2} + W]\ \}$$

in which:

N= the specific number of turbulence bars in the dryer shell;

int= an integer number of a value in {} brackets;

$\pi = 3.1415$;

Ri = the inside radius of the inner surface of the dryer shell in inches;

$\delta$ = an average depth of the layer in inches;

W= a width of each of the turbulence bars in inches.

2. A dryer bar apparatus as set forth in claim 1 wherein

the number of turbulence bars is equal to N ± 1.

3. A dryer bar apparatus as set forth in claim 1 wherein

the number of turbulence bars is equal to N ± 2.

4. A dryer bar apparatus as set forth in claim 3 further including:

a further number of hoop segments spaced circumferentially along the inner surface of the dryer shell for holding the turbulence bars in contact with the inner surface;

the number of turbulence bars being a multiple of the further number of hoop segments.

5. A dryer bar apparatus as set forth in claim 1 wherein

N = 3.

6. A dryer bar apparatus as set forth in claim 1 wherein

N = 4.

7. A dryer bar apparatus as set forth in claim 1 wherein

N = 5.

8. A dryer bar apparatus as set forth in claim 1 wherein

N = 6.

9. A dryer bar apparatus as set forth in claim 1 wherein

N = 7.

10. A dryer bar apparatus as set forth in claim 1 wherein

N = 8.

11. A dryer bar apparatus as set forth in claim 1 wherein

N = 9.

12. A dryer bar apparatus of a dryer for drying a web in a papermaking machine, the apparatus comprising:

a rotatable dryer shell of cylindrical configuration, the shell defining ~~and~~ an outer and an inner surface;

a number of dryer bars pressed outwardly against the inner surface, each of the bars extending in a cross machine direction along the inner surface; and

each bar being spaced from an adjacent bar by a quarter-resonant spacing for maximizing uniformity of the transfer of thermal energy in the cross machine direction and minimizing the transfer of thermal energy through the dryer shell from the inner to the outer surface, such that a rate of heat transfer through the dryer shell from the inner to the outer surface is minimized while optimizing a temperature uniformity in the cross machine direction.

13. A dryer bar apparatus as set forth in claim 12 wherein

the quarter-resonant spacing is determined by an equation:

$S=4\pi( Ri\delta)^{1/2}$ in which;

S= the quarter-resonant spacing;

$\pi = 3.1415$;

Ri = the inside radius of the inner surface of the dryer shell in inches;

$\delta$ = an average depth of a layer of condensed steam disposed adjacent to the inner surface in inches.

14. An apparatus as set forth in claim 12 wherein

a cross-section of each of the bars is within a range from 0.25 inches x 0.25 inches to 1.0 inches x 1.50 inches;

each of the bars is metallic and of hollow tubular configuration;

the apparatus including:

at least one hoop for pressing each of the bars against the inner surface of the dryer shell;
the at least one hoop including:

at least one segment.

**(K)**

**(ix)** **Evidence appendix.**

**1/** **US5,564,494 to Salminen pages 1-21**

**(L) Related proceedings appendix:**

**None**